

## AMENDMENTS TO THE CLAIMS

1-19. (Canceled)

20. (Currently Amended) A plasma etching method of performing plasma etching to a silicon-on-insulator (SOI) substrate in a treatment chamber, said plasma etching method comprising:

~~introducing, into the treatment chamber, an etching gas which includes a fluorine compound gas and a rare gas;~~

~~energizing the etching gas into a plasma state by supplying electricity to the etching gas, the electricity having a frequency that is equal to or more than 27 MHz; and~~

~~etching the object using the plasma;~~

~~wherein the fluorine compound gas is sulfur hexafluoride (SF<sub>6</sub>) gas;~~

~~wherein the rare gas is helium (He) gas;~~

performing a first etching including

introducing a first etching gas into the treatment chamber, the first etching gas including sulfur hexafluoride (SF<sub>6</sub>) gas, helium (He) gas, and oxygen (O<sub>2</sub>) gas, but not including polymer forming gas,

energizing the first etching gas into a plasma state, and

etching silicon of the SOI substrate until a stopper layer in the SOI substrate is exposed, so as to form a trench;

performing a second etching including

introducing a second etching gas into the treatment chamber after the first etching, the second etching gas including SF<sub>6</sub> gas, He gas, and polymer forming gas, but not including O<sub>2</sub> gas, and

energizing the second etching gas into a plasma state by applying electricity to the second etching gas, the electricity having a frequency that is equal to or more than 27 MHz, and

etching silicon of the trench in the SOI substrate,

wherein a volumetric flow rate of the helium (He) He gas introduced into the treatment chamber in the second etching is equal to or more than 80% of a total volumetric flow rate of the

etching gas, and wherein the etching gas does not contain oxygen ( $O_2$ ) gas and further includes polymer forming the second etching gas.

21-23. (Canceled)

24. (Previously Presented) The plasma etching method according to Claim 20, wherein an inside wall of the treatment chamber is made of an insulating material.

25. (Original) The plasma etching method according to Claim 24, wherein the insulating material is one of quartz, alumina, an aluminum matrix with alumite treatment, yttrium oxide, silicon carbide, and aluminum nitride.

26. (Currently Amended) The plasma etching method according to Claim 20, wherein the first etching gas further includes chlorine ( $Cl_2$ ) gas.

27. (Currently Amended) The plasma etching method according to Claim 26, wherein a volumetric flow rate of the chlorine ( $Cl_2$ ) gas introduced into the treatment chamber is equal to or less than 10% of a total volumetric flow rate of the first etching gas.

28-30. (Canceled)

31. (Currently Amended) The plasma etching method according to Claim 20, wherein the polymer forming gas is ~~one of~~ octafluorocyclopentene ( $C_5F_8$ ) gas ~~and hexafluorobutadiene ( $C_4F_6$ ) gas.~~

32. (Canceled)

33. (Currently Amended) The plasma etching method according to Claim 20, wherein the first and second etching gas ~~is~~ gases are energized into a plasma state by an inductively coupled plasma (ICP) method.

34-37. (Canceled)

38. (New) The plasma etching method according to Claim 20,  
wherein the polymer forming gas is hexafluorobutadiene ( $C_4F_6$ ) gas.